

REMARKS

This application has been carefully reviewed in light of the Office Action dated June 11, 2010. Claims 1 to 19 are pending in the application. Claims 1, 6 and 16 to 19 are the independent claims. Reconsideration and further examination are respectfully requested.

Applicants thank the Examiner for the indication that Claims 1 to 5, 16 and 18 are allowable if rewritten to overcome the outstanding rejections. In keeping with this indication, Claims 1 to 5, 16 and 18 have been amended to overcome the outstanding rejections, as discussed more fully below.

Applicants also thank the Examiner for the indication that Claims 7 to 14 would be allowed if rewritten in independent form including all the limitations of the base claim and any intervening claims. Applicants have decided not to rewrite Claims 7 to 14 as suggested at this time, as it is believed that the corresponding base claims are allowable over the art, as discussed more fully below.

Claims 1 to 19 were rejected for obviousness-type double patenting over Claims 1 to 16 of U.S. Patent No. 7,539,354. The rejection is traversed, for the reason that the Office failed to apply a test for “two-way obviousness”. See MPEP § 804, pages 800-22 to 800-26. The application of a test for “two-way obviousness” is seen as appropriate in this case, where it is clear that there have been administrative delays in issuance of a first Office Action on the merits.

Claims 1 to 15, 18 and 19 were rejected under 35 U.S.C. § 101 for allegedly being directed to non-statutory subject matter. In particular, Claims 1 to 15 were rejected for being a process which does not tie to another statutory category or transform the

underlying subject matter, whereas Claims 18 and 19 were rejected for being directed to a medium which may include transitory media. Without conceding the correctness of either position, the rejection is believed to have been attended to by the amendments set out above. Withdrawal of the rejection is therefore respectfully requested.

Claims 6, 15, 17 and 19 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 6,266,452 (McGuire). This rejection is respectfully traversed, as discussed more fully below.

Independent Claims 6, 17 and 19 generally concern determining at least rotation and scale parameters of a transformation relating two images.

According to aspects of Claims 6, 17 and 19, a multi-channel function is formed of each of the images by applying an operator to the images. The operator is commutative to rotation and scale.

For example, according to one example embodiment described in the specification at pages 11 and 12, two images are input, and a processor forms a multi-channel function from the images. In particular, complex images are formed from the images, such that when each complex image is Fourier transformed, a non-Hermitan result with a non-symmetric Fourier magnitude is produced. The complex images are formed by applying an operator that is commutative within a constant to rotation and scale. Naturally, it is understood that the claims are not limited by the disclosed embodiment, which is simply one example of an embodiment according to the claims.

By virtue of this arrangement, it is ordinarily possible to translate images while reducing ambiguities (e.g., a 180-degree ambiguity) and noise.

Referring specifically to claim language, independent Claim 6 is directed to a computer-implemented method of determining at least rotation and scale parameters of a transformation relating two images. The method includes forming a multi-channel function of each of the images by applying an operator to the images, the operator being commutative within a constant to rotation and scale. The method further includes forming a representation of each of the multi-channel functions that is invariant to translation of the multi-channel function, and performing correlation in the log-polar domain between the representations; detecting a magnitude peak in the correlation. Additionally, the method includes determining the rotation and scale parameters from the position of the magnitude peak.

Independent Claims 17 and 19 are directed to an apparatus and a computer-readable memory medium, respectively, substantially in accordance with the method of Claim 6.

The applied art is not seen to disclose or suggest the features of Claims 6, 17 and 19, and in particular is not seen to disclose or suggest at least the features of (i) forming a multi-channel function of each of at least two images, and (ii) applying an operator to the images which is commutative to rotation and scale.

As understood by Applicants, McGuire is directed to a method for registering a pattern image with a reference image. A Fourier-Mellin invariant is used to perform the registration by isolating the rotation, scale and transformation parameters of a Rotation-Scale-Translation transformation between the reference image and the pattern image. See McGuire, Abstract.

Page 4 of the Office Action asserts that McGuire (Figure 4, elements 112r and 112p) discloses forming a multi-channel function of each of at least two images, by applying an operator to the images which is commutative to rotation and scale.

However, the cited portions of McGuire are seen simply to disclose performing a single channel operation on an image. In particular, McGuire's steps 112r, 114r, 116r, 118r, 120r, 122r, 140r and 142r are seen to perform single channel operations on the reference image, whereas McGuire's steps 112p, 114p, 116p, 118p, 120p, 122p, 140p and 142p are seen to perform single channel operations on the pattern image. See McGuire, Figures 4 to 6. Thus, McGuire is not seen to form a multi-channel function of at least two images.

Moreover, McGuire's operator is not seen to be commutative with both of rotation and scale. In particular, while McGuire's operator may arguably be commutative to scale, McGuire is not seen to disclose or suggest that the operator is commutative to rotation as well. In that regard, McGuire explicitly states "[r]otation and scale do not commute with tiling". McGuire, Column 3, lines 66 and 67.

Further, the wavelet decomposition in McGuire is not seen to be commutative with rotation. In particular, the well-known wavelet transform used in image compression (e.g., JPEG2000) is based on a tensor product of 1-D wavelet transforms, and is therefore highly sensitive to rotation, as opposed to being commutative to it.

Accordingly, McGuire is not seen to disclose or suggest at least the features of (i) forming a multi-channel function of each of at least two images, and (ii) applying an operator to the images which is commutative to rotation and scale.

Therefore, independent Claims 6, 17 and 19 are believed to be in condition for allowance, and such action is respectfully requested.

The other pending claims in this application are each dependent from the independent claims discussed above and are therefore believed allowable over the art of record for at least the same reasons. Because each dependent claim is also deemed to define an additional aspect of the claims, however, the individual consideration of each on its own merits is respectfully requested.

Turning to a formal matter, Applicants respectfully request that the next Office communication indicate consideration for the art cited in the Information Disclosure Statement dated June 15, 2010.

No other matters being raised, the entire application is believed to be in condition for allowance, and such action is courteously solicited.

Applicants' undersigned attorney may be reached in our Costa Mesa, California office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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